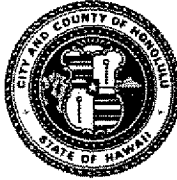


DEPARTMENT OF TRANSPORTATION SERVICES  
**CITY AND COUNTY OF HONOLULU**

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MUFU HANNEMANN  
MAYOR



WAYNE Y. YOSHIOKA  
DIRECTOR

RICHARD F. TORRES  
DEPUTY DIRECTOR

February 27, 2008

The Honorable Barbara Marshall, Chair  
and Members  
Honolulu City Council  
530 South King Street, Room 202  
Honolulu, Hawaii 96813

RECEIVED

CITY CLERK  
HONOLULU, HAWAII  
FEB 20 1 04 PM '08

Dear Chair Marshall and Councilmembers:

We are transmitting 13 copies of the Technology Selection evaluation from Mr. Ken Knight. Mr. Knight's report was received by this office after the Panel Chair, Mr. Ron Tober, submitted the Technology Selection Panel's final report on February 22, 2008. Please add a copy of Mr. Knight's evaluation to the report.

Very truly yours,

A handwritten signature in black ink, appearing to read "Wayne Y. Yoshioka".

Wayne Y. Yoshioka  
Director

Attachments

APPROVED:

A handwritten signature in black ink, appearing to read "Wayne M. Hashiro".

Wayne M. Hashiro, P. E.  
Managing Director

DEPT. COM. 140

AR00055199

# TECHNOLOGY SELECTION EVALUATION

Panel Member: Kenneth G. Knight, P. Eng.

| Criteria                       |  |  | Rubber Tire  | Steel Wheel/Rail   | Monorail  | Mag-lev   |
|--------------------------------|--|--|--|--|---|---|
| <b>I FUNCTIONALITY</b>         |  |  |  |  |   |   |
| I.a                            | System capacity - 9,000 pphpd  |  | Yes  | Yes  | Yes   | Yes   |
| I.b                            | 40 minute end to end runtime for First project   |  | Yes  | Yes  | Yes   | Yes   |
| I.c                            | Guideway switching and crossovers accommodate 2 minute headways or less in the future  |  | Yes  | Yes  | Questionable  | Questionable  |
| I.d                            | Can other manufactures provide interoperable vehicles  |  | Questionable   | Yes  | Yes   | Yes   |
| I.e                            | Can multiple manufacturers provide interfacing systems equipment   |  | Questionable   | Yes  | Questionable  | Questionable  |
| I.f                            | Would system comply with federal and state regulations, including ADA, Buy America Act, and NFPA 130                                   |  | Yes  | Yes  | Yes   | Yes   |
| I.g                            | Features that reduce impact of construction  |  | Slightly wider but minimum depth guideways                                     |  | Narrower but deeper guideway                                  |   |
| I.h                            | Are there any geometric constraints that would add cost or limit performance   |  | No   | 6% vertical grades would eliminate two responders                    | No  | No  |
| I.i                            | Meets 75dBA maximum noise level at stations  |  | Yes  | Yes  | Yes   | Yes   |
| I.j                            | Can provide electrical propulsion, with power distribution via 3rd rail  |  | Yes  | Yes  | Yes   | Yes   |
| I.k                            | Bi-directional, fully automatic operation, capable of 2 minute headways, and capable of being coupled into multi-car consists          |  | Yes  | Yes, with modifications to LRT-type vehicles                         | Yes   | Yes   |
| I.l                            | Maximum platform length of 300 feet  |  | Yes  | Yes  | Yes   | Yes   |
| I.m                            | Yard and Maintenance Facility  |  | ATO available in storage areas.  | ATO available in storage areas.                                      | Higher cost facilities  | Higher cost facilities  |
| I.n                            | Quiet operation. All systems can operate with acceptable levels of noise. Systems ranked with lowest noise levels #1                   |  | #2   | #3   | #2  | #1  |
| I.o                            | Recovery of failed trains. On-line emergency storage tracks should be added in selected locations.                                     |  | No problem   | No problem   | Costly on-line, emergency storage tracks                      | Difficult with no wheels                                      |
|                                | C  |  |  |  |   |   |
| <b>II COSTS</b>                |  |  |  |  |   |   |
| II.a                           | Guideway costs. In Line sections, extra width would add cost. In stations, extra depth would add cost.                                 |  | Higher   | Higher   | Lower   | Lower   |
| II.c                           | Vehicle and systems costs  |  | Limited number of suppliers  | Multiple suppliers provide better cost competition                   | One supplier  | One supplier  |
| II.d                           | Proprietary technology unique costs. Ranked from lowest #1 to highest #4   |  | #2   | #1   | #3  | #4  |
| II.e                           | On-going operating and maintenance cost  |  |  |  |   |   |
| <b>III TECHNOLOGY MATURITY</b> |  |  |  |  |   |   |
| III.a                          | Has technology been proven in revenue service for at least five years  |  | Technology proven in limited number of the world's major rapid transit systems | Technology proven in most of the world's major rapid transit systems | Technology not used for rapid transit systems in major cities | Technology not used for rapid transit systems in major cities |
| III.b                          | Does the technology use proven off-the-shelf components  |  | Mostly   | Yes  | Mostly  | Questionable  |
| III.c                          | Are there any technology risks to the proposed technology  |  | No   | No   | No  | Questionable at this time                                     |
| III.d                          | What guarantee is there for long term parts availability for replacement vehicles, systems equipment, spare parts and software support |  | Some vehicle components sole source  | Good   | Some vehicle components sole source                           | Questionable  |

| RESPONSES TO TECHNOLOGY RFI, HONOLULU |                                |              |               |                        |                  |                            |            |                       | Non - Compliant Responses |                         |                        |                |                            |
|---------------------------------------|--------------------------------|--------------|---------------|------------------------|------------------|----------------------------|------------|-----------------------|---------------------------|-------------------------|------------------------|----------------|----------------------------|
| Technology                            | Steel Wheel/ Rail              |              |               | Rubber Tires/ Concrete |                  |                            | Monorail   | Maglev                | Steel Wheel/ Rail         |                         | Rubber Tires/ Concrete |                |                            |
|                                       | 1                              | 2            | 3             | 4                      | 5                | 6                          | 7          | 8                     | 1                         | 2                       | 3                      | 4              | 5                          |
| Proposer                              | Ansaldo Breda/<br>Union Switch | Bombardier   | Siemens, S70  | Siemens, Cityval       | Siemens, VAL 208 | IHI (Japan)<br>Corporation | Hitachi    | Mitsubishi/<br>Itochu | Alstrom                   | Mitsubishi/<br>Sumitomo | APTS/ Phileas          | Translohr      | Thales                     |
| Operations                            | ATO                            | ATO          | LRT           | ATO                    | ATO              | ATO                        | ATO        | ATO                   | HRT                       | LRT                     | Guided bus             | Non-responsive | Non-compliant              |
| Vehicles                              |                                |              |               |                        |                  |                            |            |                       |                           |                         |                        |                |                            |
| Length (ft)                           | 42.67                          | 55.28        | 96.4          | 36.7                   | 85.7             | 40.2                       | 46.3       | 45.0                  | 43.3                      | 56.0                    | 85.3                   |                | Formerly                   |
| Configuration                         | Single                         | Single       | Articulated   | Single                 | Married Pair     |                            |            |                       |                           |                         |                        |                | Alcatel                    |
| Width (ft)                            | 8.20                           | 8.23         | 8.70          | 9.2                    | 6.8              | 9.3                        | 9.3        | 8.5                   | 8.5                       | 9.1                     | 8.3                    |                |                            |
| Weight (lb)                           | 40,333                         | 47,400       | 95,085        | 33,620                 | 68,560           |                            | 68,273     | 38,581                |                           |                         | 49,200                 |                |                            |
| Trains                                |                                |              |               |                        |                  |                            |            |                       |                           |                         |                        |                |                            |
| Number of Cars                        | 3                              | 2            | 1             | 1                      | 2                | 6                          | 4          | 4                     | 3                         | 4                       | 1                      |                |                            |
| Train Length, over couplers (ft)      | 128.0                          | 110.56       | 96.40         | 36.7                   | 85.7             | 241.2                      | 185.3      | 180                   | 129.79                    | 224                     | 85.3                   |                |                            |
| Floor Type                            | High-Floor                     | High-Floor   | 70% Low Floor | High-Floor             | High-Floor       | High-Floor                 | High-Floor | High-Floor            | High-Floor                | 70% Low Floor           | 100% low-floor         | Low-floor      | Formerly                   |
| Height above T/R (ft)                 | 2.79                           |              | 1.25          | 3.61                   |                  |                            |            |                       |                           |                         |                        |                | Alcatel -<br>Train Control |
| Mainline Alignment                    |                                |              |               |                        |                  |                            |            |                       |                           |                         |                        |                |                            |
| Maximum Grade                         | 6%                             | 6.50%        | 7%            | 12%                    | 8%               | 7%                         | 6%         | 7%                    | 4%                        | 4%                      | 13%                    | 13%            |                            |
| Minimum Horizontal Curve Radius (ft)  | 623                            | 230          | 656           | 98                     | 131              | 131                        | 200        | 246                   | 230                       | 656                     | 41                     |                |                            |
| Minimum Vertical Curve Radius (ft)    |                                |              |               |                        |                  |                            |            |                       |                           |                         |                        |                |                            |
| Crest                                 | 3,280                          | 2,625        | 820           | 8,164                  | 3,445            | 820                        | 3,281      | 4,921                 | 1,641                     | 5,000                   | 172                    |                |                            |
| Sag                                   | 3,280                          | 2,625        | 1,150         | 8,164                  | 3,445            | 820                        | 3,281      | 4,921                 | 1,641                     | 5,000                   | 172                    |                |                            |
| Motors                                | Rotary                         | LIM          | Rotary        | Rotary                 | Rotary           | Rotary                     | LIM        | LIM                   | Rotary                    | Rotary                  | Allison Diesel         |                |                            |
| System Voltage                        | 750 Vdc                        |              | 750 Vdc       | 750 Vdc                | 750 Vdc          | 750 Vdc                    | 1,500 Vdc  | 1,500 Vdc             |                           | 750 Vdc                 |                        |                |                            |
| Power Source                          | Third rail                     | Fourth Rail  | Third rail    | Third rail             | Third rail       | Third rail                 |            |                       |                           | Third rail              |                        | Catenary       |                            |
| Maximum Operating Speed (mph)         | 50                             | 55           | 66            | 55                     | 50               | 55                         | 50         | 62.1                  | 49.7                      |                         | 55                     | 55             |                            |
| In-service in cities                  | Copenhagen                     | Vancouver    | Houston       | In operation??         | Chicago O'Hare** | Osaka                      | Osaka      | Tobu Kyuryo           | Hamburg                   | Hong Kong               | Eindhoven              | Tianjin        |                            |
| Primarily Airport service**           | Milan                          | Kuala Lumpur | San Diego     |                        | Roissy Paris**   | Kanazawa                   | Tokyo      |                       |                           | Manila Line 1           |                        | L'Aquila       |                            |
|                                       | Rome                           | NY JFK       | Charlotte     |                        | Lille            | Kansai**                   | Tama       |                       |                           | Dubai                   |                        | Padua          |                            |
|                                       | Brescia                        |              |               |                        | Rennes           | Tokyo                      | Osaka      |                       |                           |                         |                        | Clermont-      |                            |
|                                       | Thessalonica                   |              |               |                        | Toulouse         | Taipei**                   | Kitakyushu |                       |                           |                         |                        | Ferrand        |                            |
|                                       |                                |              |               |                        | Torino           |                            | Okinawa    |                       |                           |                         |                        |                |                            |
|                                       |                                |              |               |                        |                  |                            | Chongqing  |                       |                           |                         |                        |                |                            |
| Competition                           | High                           | High         | High          | Medium                 | Medium           | Medium                     | Low        | Low                   | High                      | High                    | Low                    | Low            |                            |
| Factory in USA                        |                                | Yes          | Yes           |                        |                  |                            |            |                       |                           |                         |                        |                |                            |
| Storage Yard                          | Automated                      | Automated    |               |                        |                  |                            |            |                       |                           |                         |                        |                |                            |

| System Supply Capacity                   |   |                           |            |              |                     |                       |       |                      |                     |                           |                |                   |                              |                                  |                                  |                                  |
|--|---|---------------------------|------------|--------------|---------------------|-----------------------|-------|----------------------|---------------------|---------------------------|----------------|-------------------|------------------------------|----------------------------------|----------------------------------|----------------------------------|
|  |   | Vehicle Capacity          |            |              |                     |                       |       |                      |                     |                           | TRAIN CAPACITY |                   |                              | Supply Capacity / Hour           |                                  |                                  |
| Technology                               | Supplier                                | Length over Couplers (ft) | Width (ft) | No. of Doors | Width of Doors (ft) | % of Total Door Width | Seats | Standee Area (sq. m) | Standees @ 3/sq. m. | Design Capacity (persons) | No. of Cars    | Train Length (ft) | Capacity/ Train (passengers) | 5-min. Headways, 12 trains/ hour | 3-min. Headways, 20 trains/ hour | 2-min. Headways, 30 trains/ hour |
| Steel Wheel/ Steel Rail                  | Ansaldo Breda/ Union Switch             | 42.7                      | 8.20       | 2            | 5.3                 | 24.6                  | 32    | 17.4                 | 52                  | 84                        | 6              | 256               | 505                          | 6,065                            | 10,108                           | 15,161                           |
|  | Bombardier                              | 55.3                      | 8.23       | 3            | 5.3                 | 28.5                  | 42    | 21.5                 | 65                  | 107                       | 4              | 221               | 426                          | 5,112                            | 8,520                            | 12,780                           |
|  | Siemens S70                             | 96.3                      | 8.70       | 4            | 4.8                 | 20.0                  | 72    | 28.0                 | 84                  | 156                       | 3              | 289               | 468                          | 5,616                            | 9,360                            | 14,040                           |
| Rubber Tire                              | Siemens, Cityval                        | 36.8                      | 9.18       | 2            |                     |                       | 30    | 13.3                 | 40                  | 70                        | 7              | 257               | 488                          | 5,859                            | 9,765                            | 14,648                           |
|  | Siemens, VAL 208                        | 42.9                      | 6.83       | 3            | 4.3                 | 29.9                  | 18    | 15.3                 | 46                  | 64                        | 6              | 257               | 384                          | 4,607                            | 7,679                            | 11,518                           |
|  | IHI (Japan) Corporation                 | 40.2                      | 9.30       | 2            | 6.9                 | 34.4                  | 28    | 13.0                 | 39                  | 67                        | 6              | 241               | 402                          | 4,824                            | 8,040                            | 12,060                           |
|  | APTS/ Phileas (bus), Non-bi-directional | 85.3                      | 8.33       | 4 One side   |                     |                       | 42    | 305.0                | 85                  | 127                       | 1              | 85                | 127                          | 1,524                            | 2,540                            | 3,810                            |
| Monorail                                 | Hitachi                                 | 46.3                      | 9.30       | 2            | 4.3                 | 18.4                  | 32    | 18.8                 | 56                  | 88                        | 4              | 185               | 353                          | 4,236                            | 7,060                            | 10,590                           |
| Maglev                                   | Mitsubishi/ Itochi                      | 45.0                      | 8.50       | 2            |                     |                       | 24    | 17.8                 | 53                  | 77                        | 4              | 180               | 309                          | 3,708                            | 6,180                            | 9,270                            |
| Honolulu stations, platform length (ft)* |   |                           |            |              |                     |                       |       |                      |                     |                           |                | 300*              |                              |                                  |                                  |                                  |